The **Fissile Materials Cutoff Treaty** (FMCT) would be the logical follow-up to the Comprehensive Test Ban Treaty; it would focus on the nuclear materials that end up in nuclear weapons. Their production would be forbidden. This would be a substantial step towards the ultimate goal of a “*Nuclear Weapon Convention*”, a treaty that would be universal just like the Chemical Weapons Convention. At first, the obstacles do not look insurmountable, since such a treaty is seemingly acceptable to the parties directly concerned, the five official Nuclear Weapons States (NWS).

Yet, no progress has been achieved in Geneva at the Conference on Disarmament (CD). Abusing its veto right, Pakistan opposes already the mere beginning of a negotiation for fear that its stocks of nuclear materials would for ever remain lower than India’s. One might assume that this situation will continue as long as the United States of America has not given Pakistan the same civilian nuclear privileges as those offered to India.

Frustrated, the world community seeks to untangle the Gordian knot, possibly by taking the FMCT issue away from the CD. But, there is a certain reluctance of the Nuclear Weapons States (NWS) in such a move. They are also not eager to lose their own veto rights in the CD or in another framework.

**2011 Side Experts Meeting on FMCT**

In early 2011, in order to help rolling the ball, the ambassadors of Australia and Japan to the CD organised a total of nine 3-hour “Side Experts Meetings on FMCT issues” in Geneva on the UN premises. The standard FMCT topics were extensively discussed:

- Objective of the treaty;
- Definitions of «fissile material for weapon purposes»;
- Scope of the treaty;
- Verification.

These events were no negotiations, only serious discussions about possible features of an FMCT. [The final report is available at http://db.tt/Mt7Tj1OE and the events’ presentations at http://db.tt/u1ezApk7]
**Some of the technical aspects discussed at the Geneva meetings**

What should “fissile material” mean? Which technological criteria should be used to determine which materials are within the scope of the treaty and therefore banned? Is any mixture containing traces of uranium-233, uranium-235, plutonium-239 or neptunium-237 to be considered “fissile”, simply because physical or chemical processing could ultimately lead to weapon-grade levels and thus be labelled “weapon-usable”? Or should it be only the best quality weapon-grade material with more than 90% uranium-235 or plutonium-239? If not, from which intermediate stage should the treaty apply? The isotopic quality could indeed be a criterion to identify various options relevant for the FMCT:

**Isotopic quality as technical inclusion criterion**

<table>
<thead>
<tr>
<th>Option</th>
<th>Isotopic quality</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>1. NPT-IAEA</strong></td>
<td>All uranium and all plutonium mixtures included - except if more than 80% Pu-238. Neptunium and americium included.</td>
</tr>
<tr>
<td><strong>2. Australian</strong></td>
<td>Same as NPT – but excluding irradiated fuel and uranium below 20% [and americium].</td>
</tr>
<tr>
<td><strong>3. Isotopic-A</strong></td>
<td>Same as NPT – but excluding uranium below 20%, recycled plutonium mixtures and americium.</td>
</tr>
<tr>
<td><strong>4. Isotopic-B</strong></td>
<td>Same as NPT - but excluding uranium below 40%, recycled plutonium mixtures, high-burnup one-pass plutonium mixtures with more than 30% (Pu-238+Pu-240), and americium.</td>
</tr>
<tr>
<td><strong>5. Russian</strong></td>
<td>Included - only HEU above 90% and plutonium with more than 90% Pu-239.</td>
</tr>
</tbody>
</table>

What does “production” mean? Does it begin with the mechanical extraction of uranium ore from the ground, or with the physical enrichment of uranium, or with mechanical fabrication of fresh fuel elements for nuclear reactors, or with fuel burning in all kinds of nuclear reactors, or only with chemical separation of burnt fuel into its constituents, plutonium in particular?

Should not the focus be on verifying the production rather than the products? Possible “production” starting points - For uranium: Yellow cake, enriching > 0.7%, enriching > 5% or enriching > 20%? For plutonium: Irradiation of uranium, handling of spent fuel or reprocessing of spent fuel?

What kind of production facilities? There are basically three categories of production facilities demanding consideration: Pre-FMCT production facilities (civilian or military) that have been shut down, close down or decommissioned; Pre-FMCT production facilities (civilian or military) that remain in use for civilian purposes and New and other production facilities.
FMCT: Verification realities – 1) Verification of the FMCT is different, because nuclear weapons and related materials are present in NWS. 2) Yet, many people dream of a verification system identical to that of the NPT, namely IAEA safeguards. 3) Yet, while accepting that the objectives are different (NPT vs. FMCT), the conceptual upper structure of IAEA safeguards provide the tools to design a proper FMCT verification system.

Quantity component of FMCT inspections – 1) IAEA safeguards: a significant quantity (SQ) is the approximate amount of nuclear material required to manufacture an explosive device (25 kgs enriched uranium, 8 kgs plutonium). 2) The FMCT is not about quantities, but about a commitment not to produce at all fissile materials for weapons purposes. 3) For practical reasons, the FMCT could use the same IAEA quantities to allow for errors and avoid unnecessarily precise measurements. Thus, the discovery of a facility producing even gram amounts of materials would be a treaty violation; the discovery of one SQ, not (but its origin would need explanations?)

Environmental sampling (ES) - ES is the collection of samples from the environment with a view to analysing them for traces of materials that can reveal information about nuclear material handled or activities conducted. The media sampled include various surfaces (e.g. of equipment and building structures), air, water, sediments, vegetation, soil and biota. The application of ES usually involves two stages: baseline sampling is performed ahead of time to establish a reference ‘environmental signature’, and routine sampling is subsequently performed to obtain data that can be compared for consistency with the established baseline environmental signature and the declared operations.

The usefulness of ES under an FMCT depends mostly on the values measured in baseline sampling at different facilities. For pre-FMCT facilities remaining in use for civilian tasks, the baseline would be so loaded with old traces, that any subsequent clandestine production could remain undetected in routine sampling. The same would hold for new facilities built on former military sites. (Shut-down facilities would be monitored by Containment/Surveillance, not by ES). In theory, ES could be as useful as under IAEA safeguards for new facilities built on new sites. Yet, contamination from dust carried in cloths by visiting staff from other facilities would be very likely, as observed by the IAEA in South Africa in 1993.

FMCT verification: undeclared activities as well? Beyond the verification of facilities and activities declared by a State party, should verification be extended to the search for undeclared facilities and activities? If no, there would be a potential risk that violations would go unnoticed in States with very complex military and civilian infrastructures. If yes, the task would then be to verify: 1. the absence of undeclared production of fissile material within the facilities that are submitted for inspection; 2. the absence of clandestine facilities; and 3. that specialized equipment/material remains dedicated to peaceful use (including dual-use equipment).

Some political considerations

The 2011 Geneva side events revealed a lot about the positions that could be taken by a number of States in a future FMCT negotiation.
The Nuclear Weapons States were very cautious, not talking much. They were opposed to the inclusion of all stocks beyond those voluntarily declared by them from time to time. They were cautious about all proposals that could expose weapon knowhow and those bringing the FMCT too close to the NPT. They were open - while non-committal - towards many other proposals.

Many Non-Nuclear Weapons States (NNWS) adopted the view – somewhat prematurely – that the FMCT is the channel to put the NWS under a NPT-like verification burden in order to move close to a future Nuclear Weapons Convention.

Many contradictions prevailed in the ranks of the developing countries (Non-Aligned Movement): they criticised the NWS for not doing enough towards nuclear disarmament, while protecting their bedfellow Pakistan when the latter blocks progress at the CD.

Altogether, the Geneva side events brought to light three categories of players: the dreamers, the pragmatic and the minimalists.

The dreamers: The dreamers want an FMCT that would impose the same rules on the NWS as those applied to the NNWS under the NPT. In essence: same objective as the NPT, same definitions of materials and production, same accounting of nuclear materials and stocks, and same verification by the same IAEA. For a pragmatic mind, this is an ambitious and expensive platform that could endanger the success of a negotiation.

In that category, the NGOs are most vocal; they provide the CD with full treaty drafts and stringent verification mechanisms. They have sometimes a broader political agenda extending beyond disarmament, namely against civilian nuclear power, in particular against spent fuel reprocessing. A number of countries also fall in that category, notably Germany (as a matter of moral non-discriminatory principle) and several developing countries from a more classical “anti-imperialistic” perspective.

The minimalists: The minimalists cling to the definition of the Shannon mandate of 1995 that called for banning the production of «fissile material for weapon purposes», that is, strictly speaking uranium enriched to more than 20% and separated plutonium of good weapon quality. Verification should therefore be limited to these materials and the related production facilities. They believe that the FMCT should not bother with the civilian fuel cycle.

The Russians have in 2006 proposed to limit the treaty to the more than 90% level: that is, above 90% for enriched uranium (U-235) and for high quality plutonium (more than 90% Pu-239). To a certain extent, the other NWS may more or less share this view, but they have not publicly admitted it yet.

The pragmatic: The pragmatic want an FMCT as soon as possible, even if not ideal. They feel that only sensitive parts and materials of the civilian fuel cycle should fall under the FMCT. The verification should be credible, but not necessarily identical to IAEA safeguards under the NPT. They could live with an FMCT that would converge towards the NPT only much later and that would initially exclude stocks. Accordingly, specific proposals have been tabled the pragmatic observers. Australia wants to restrict somewhat the definition of nuclear materials under an FMCT only to uranium enriched to more than 20% and to plutonium in separated, reprocessed form.
Four ways to free the FMCT from the CD deadlock

In Geneva, the FMCT negotiations are stalled, probably for several more years. The diplomats cannot even begin their work. The political negotiations – when they come - will turn around half-a-dozen options on “definitions/production” issues (from an NPT mirror, to the Russian simplified approach, through the Australian model, partial stocks, etc.). The selection of a suitable option will of course be part of a subsequent negotiated process, a process that cannot be pre-empted by experts, a process that will be dominated by disarmament politics and costs.

In the meantime, one could think of four ways to see FMCT negotiations move ahead on the basis of different geographical locations:

1. **Geneva**: After US concessions on civilian nuclear power to Pakistan, the Conference on Disarmament adopts a work programme and tackles the FMCT. This is unlikely. Pakistan is too unstable and unreliable to help the country sustain its nuclear activities.

2. **New York**: Untying the knot by moving the negotiations to the UN. This is not so easy to accomplish since the mandate could not simply be attached to the UN Disarmament Commission. A new organisation would probably need to be set up, with its own rules and procedures that could demand almost as much time to agree upon as negotiating the treaty itself.

3. **Anywhere**: Initiate a pre-negotiation process at the technical level to assess different parameters/options and their associated verification costs - on the basis of IAEA concepts, approaches, criteria, and inspection experience. In the preparation of the 2011 UN General Assembly, the Canadian Government tried assiduously to establish a “Group of Governmental Experts” to work on FMCT issues under the auspices of the UN. Without success. The Non-Aligned Movement crushed the attempt with the argument that such a group would “weaken the Conference on Disarmament”, as if the Conference would not already be weak and disqualified by its on-going “non-activity”.

4. **Beijing, Moscow, Paris, London, Washington**: Short of momentum on the broad multilateral stage, one could try to reduce the degree of multilateralism by bringing to the table only the five official NWS - empowered by themselves or by others - to draft a treaty acceptable to them and to a suitable degree to all other States. This draft treaty would subsequently be negotiated in details with the broader international community and finalised at the CD or directly in a dedicated UN convention.

One can only hope that the FMCT negotiations will in one way or another move forward.

ESARDA and INMM FMCT Working Groups

Whatever happens on the broad international scene, the two highly qualified special organisations, ESARDA and INMM could possibly plant some seeds by initiating some related work. These organisations comprise a large pool of specialists who could without further ado work out many aspects of
the four FMCT topics (Objective of the treaty, Definitions of «fissile material for weapon purposes», Scope of the treaty and Verification).

Proposal: For each of these FMCT “technical-political options”, dedicated ESARDA and INMM working groups would develop a suitable verification system (completed with cost assessment) on the basis of IAEA concepts, approaches, criteria, and inspection experience. In 2010, INMM did establish a WG under the Chair of Tom Shea. The 2011 ESARDA Reflection Group has also proposed an active involvement in the FMCT process.

Specific steps for ESARDA: as a service to future negotiations, establish a detailed framework, a pragmatic overall concept and specific modalities for a future verification system (as done previously in the case of the CTBT prior to the political negotiations at the CD), and this from the particular European perspective (two NWS and many NNWS).

1. First: select a set of practical options in terms of scope and definitions.
2. Then for each option: assess with some details the objectives, the measures and the activities to be used by the verification agency – on the basis of the IAEA safeguards methodology.
3. Leaning on the IAEA, develop an implementation model from which potential organisation features and costs could be derived.

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